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THE MANAGER, THE WORKMAN, AND THE SOCIAL SCIENTIST[1]

THEIR FUNCTIONAL INTERDEPENDENCE AS OBSERVERS AND JUDGES OF INDUSTRIAL MECHANISMS, PROCESSES AND POLICIES.

BY H. S. PERSON[2]

MAR 1917

During the period in which I have acted as your presiding officer, I have purposely refrained from the presentation of addresses and from participation in discussion. I have believed my contribution could be the more effective if limited to the planning of programs and to the continued development on a high plane of the conduct of our meetings. To-night, however, I lift that self-imposed embargo, for the growth in the effectiveness of your cooperation, the intensity of discussion and the influence of this Society has reached a point which, I am convinced, makes it opportune for me to lay before you certain considerations of the deepest importance; certain principles which have governed and should continue to govern the development of this Society.

These principles have manifested themselves particularly in the construction of our programs for the discussion of scientific management. I have been aware of an inquiry in some minds why our programs have consistently provided for the discussion of the social as well as the purely technical aspects of scientific management. I have been aware also of an occasional inquiry how the views of professors and other "theorists" could be of value to an association of "practical" men. In fact, at our last meeting one of the most prominent of industrial engineers, in a perfectly proper and courteous remark interpolated into his discussion of a university professor's contribution, questioned the value of the opinions of theorizing professors of economics. My first reaction was a stirring of my sense of humor by realization of the fact that the distinguished organizer and manager who was speaking is, by virtue of his tendency to search for fundamental industrial principles, the most professor-like of the industrial engineers of my acquaintance. My second reaction was the realization that there had been presented the opportunity to explain the vital principles which have demanded the inclusion in our programs of the discussion of the social aspects of scientific management by workingmen and so-called theorists as well as by practical engineers.

The programs of our meetings were made up at the beginning of discussions of scientific management with no more than passing allusion to its influence on industrial progress. At the last meeting two sessions—the most significant in attendance and enthusiasm—were devoted to a discussion of the effects of scientific management on the individual worker and on industrial progress. During the past two or three years in the development of discussion of problems of particular interest to us, to the point of view of the manager have been added two other points of view—that of the workman and that of the social scientist. By manager I mean any one of that group of executive officers, of higher or lower degree, who are responsible for the organization and operation of a going industrial concern. By workman I mean the individual employee, or any spokesman of organized labor. By the social scientist I mean that group made up of professors of economics and sociology, social workers, editors of surveys and new republics, and so on. While it is true that individuals who have participated in our discussions may have represented points of view which do not fall clearly into any one of these three classes—points of view which are composites of two or of all three; nevertheless, you will agree that there have been these three distinct angles of approach to the discussion of our problems; those of the manager, the workman, and the social scientist.

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[1] A paper to be presented at the Boston meeting of the Taylor Society, March 3, 1917.

[2] President of the Taylor Society and Director, Amos Tuck School of Administration and Finance, Dartmouth College, Hanover, N. H.

It is my thesis that no one of these individuals sees the problems of scientific management with an eye which reveals the whole truth; that each is, by some economy manifest in the unconscious organization of persons for the investigation of truth, a functionalized observer of industrial facts and judge of their significance; that each is complimentary to and essential to the other; and that no organization which stands as advocate for one of the latest major contributions to industrial development, as does this Society, can accomplish its purpose if it fails to consider every possible approach to the examination and valuation of the particular contribution which it seeks to promote.

Each of these examining and appraising agencies—manager, workman, and social scientist—in the performance of the common function, possesses advantages and disadvantages not possessed by the other two. What are the principal advantages and disadvantages of each?

THE MANAGER

The manager of a business is one who performs the social service of adjusting the creation of certain utilities embodied in commodities or services, to the demands of individuals for those utilities, in a manner economical of human energy and equipment. The allowance which society makes to him and to his family as a reward for this service should enable him and his family not only to live but also to enjoy certain things which make life to them worth living. The amount of this allowance is determined in most instances (I do not wish to go into refinements) by the degree to which he is economical of human energy and equipment. That economy is popularly called efficiency. To succeed in putting together economically the energy, skill and materials necessary to create commodities or services is no easy matter. In the first place, a very small change in conditions causes the manager's operations to pass from an efficiency which society approves and rewards to an inefficiency which society may not only refuse to reward, but for which it may exact a penalty. In the second place, the elements which the manager must unite in his operations are not stable, and a combination which may be economical at one moment may not be so at the next. There are two results of this instability of elements with which the manager works and of this narrow margin for social approval within which his variations in economy are confined. One is the constant, concentrated attention he must give to the varying elements and their varying combinations—a confinement which deprives him of the opportunity for developing breadth of view. The other is the effort to minimize these variations in elements by standardization of one sort or another, an effort which incurs the danger of his achieving an apparent but unnatural stability which results, without his perceiving the reasons therefor, in maladjustments to the changing industrial world in which he operates.

This simple description of the nature of the manager's function makes it apparent that in valuing industrial mechanism, processes or policies, he suffers disadvantages and enjoys advantages which are unique to him.

There seem to be four disadvantages. First: the fact that the manager's attention is concentrated on the unstable elements of his business—the varying details. I admit that the supervision of many of these details may be delegated, and to the extent that they are delegated the manager frees himself from this limitation. But those who thus free themselves are so few as to be conspicuous. This concentration on technical aspects of the business denies to the manager opportunity to observe the great facts of social and industrial evolution. He may even not keep up with the development of human thought concerning the very service which he performs for society. He has but little time to acquaint himself with the results of investigations of others. He has but little time for books which are the records of the investigations and thinking of others. He has, in fact, but little time for newspapers and other periodicals. Lack of time from business is too frequently as fatal for him as is lack of education for many others; he falls into the habit of accepting statements of facts of industrial evolution which are not true, and opinions

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of others concerning economic principles which are not sound.

Second: the very nature of his responsibilities compels him to regard and to value all things from the point of view of profits. In most instances he is wholly unaware that there are other standards of valuation of the mechanism, processes and policies, which he is called upon to consider. In those instances in which he may feel there are other standards of valuation, he is too often unable to free himself from the insistent demands which the problems of the ever changing elements of his business crowd upon him, to inquire what those other standards may be. His is a business in which he who hesitates is lost, and he therefore may not stop to work out more than superficial changes; he may not stop to inquire about the fundamental principles of his own managerial activities.

Third: he is subject to the tendency to seek relief from changeability and uncertainty in the elements which he controls by unconscious over-standardization of all of those elements. Some of them—the material elements—by their nature may be standardized, and their standardization brings relief. Others, such as the quantity and quality of demand and the human elements in production, do not lend themselves to the same kind or degree of standardization, but he too frequently fails to perceive distinctions and attempts to reduce these elements to the same kind and degree of control as he applies to others. The result is a mass of new problems added to those with which he is already overwhelmed.

Fourth: he is subject to the danger of regarding all the elements which he directs as commodities, and of failing to recognize that spiritual factors are involved. Particularly, he too frequently fails to recognize that labor as a simple physical force cannot be separated from labor as a distinct and original seat of human intellect, feelings, desires and opinions. Labor as a spiritual force is the most subtle and changeable of all the factors which he combines for the purpose of service through production.

These are the limitations, suffered in various degrees by various managers, which seem to me to render it impossible for them to see the whole truth in estimating new contributions to industrial progress. However, these are but limitations to conspicuous advantages. What are the manager's advantages?

I shall not dwell upon the most significant of his advantages: they are well known and come immediately to our minds. They proceed from superior intelligence combined with experience in the conduct of industrial operations. Most managers are men of great natural ability which is made more effective by technical or other training. Those who have not had the advantage of formal training enjoy perhaps compensating superior natural ability which has enabled them to forge ahead in managerial operations: which has caused them to be set aside by natural selection as industrial leaders. Intellectual ability, disciplined by experience in the industrial field, makes them the keenest observers of industrial facts and renders their judgments in the treatment of industrial problems the soundest. I do not do more than indicate these advantages, dominating as they are, because they are so patent.

His other advantages may be summed up in the statement that the industrial machinery is a result of evolution; that at any one moment it is a complex of numerous finely-adjusted parts; that a slight maladjustment of the parts may bring disaster to many individuals and a major maladjustment may bring disaster to society; that the changes of evolution must be accomplished by small steps and while the machinery is in operation; that the manager himself is a part of this complex machinery; and *particularly* that he senses all the complexity and delicacy of this industrial machine and the necessity of the avoidance of even slight maladjustment. He senses these facts, even when he does not attempt to explain them, because he has grown up in the midst of them—is of them. He has vast technical information and specially developed faculties which operate in the plane of industrial processes. In the solution of many of his problems, he does not have to rely on the conscious exercise of reasoning powers or the conscious application of rules and directions; he holds sub-conscious intercourse with the laws and principles behind his problems, and solves them "on the wing." Otherwise the solution of many of them would be impossible; the opportunity to solve them would vanish before investigation and deliberate reasoning could become operative. As the driver of a motor-bus evolves a sense for velocities and distances, which enables him instinctively to make openings which are to the passenger apparently impossible, so the manager develops special senses which enable him instinctively to estimate the adaptability to industrial processes and the influence on them, of new mechanism, processes or policies. To those not performing the managerial function, this technical information and these special senses are denied. It is possession of this technical information and of these special senses, that makes the manager the "practical" man. The intuitive judgment of the practical man is as reliable and necessary as the consciously reasoned judgment of other men.

These advantages enable him to discern aspects of the truth, in considering the effects of new industrial mechanism, processes or policies, which other judges are unable to see.

THE WORKMAN

It has been the traditional opinion, developed through long social experience which it is not necessary to examine here, that the workman, because workman, has no occasion to examine and pass judgment upon new industrial processes or policies. It has furthermore been a traditional opinion that he could not exercise sound judgments in such matters if called upon to do so. The workman has been looked upon as possessing a commodity which he sells to the manager, as the farmer sells wheat to the miller. While it has been recognized that when the workman offers labor for sale he offers not only physical energy but with it a combination of mental and manual dexterity called skill, nevertheless, the traditional opinion has not risen to the conception that labor has any other interest in the transaction than the sale of a commodity. During recent years an entirely different opinion has been developing, and is held not only by working men, but by many social scientists and by an appreciable number of enlightened managers. To attempt to account for the development of this new point of view would take us too far afield. The majority, I imagine, of those who entertain it, qualify it with the condition that while in principle the workman is entitled to examine and pass judgment upon the manager's disposition of his labor, in practice that is impossible because the workman is not qualified by managerial experience to make such examinations and pass such judgments. A minority, on the other hand, advocate the new point of view without such qualification, and assert that labor is entitled to exercise the right of acting under the principle, whatever the degree of skill he manifests in making judgments; that he will learn to make better judgments on managerial matters by experience and responsibility; and that society, even at the cost of a temporary period of less fruitful management (conceded for the sake of argument), should bear the cost of the workman's apprenticeship in managerial responsibility. They assert also that life is more important than industry, happiness more important than profits, and that happiness can be secured only by giving every individual opportunity for the exercise of all his interests and the development of all his faculties, one of which is the faculty of managerial and creative activity. They assert further that the increased technical productivity resulting from the exercise of such a function by workmen, together with the increased productivity resulting indirectly as the result of greater co-operation, will more than compensate for the loss resulting from errors in judgment during the period of labor's apprenticeship in managerial responsibility. Finally they assert that in our society and with our form of government, with labor self-conscious, organized and numerically strong as it is, experiments in the participation of labor in management are sure to be made, experiments which management should anticipate, and in which management should fearlessly and honestly co-operate. Assuming that to be the case, let us ask ourselves what may be the workman's competence to be judge of the desirability of new industrial mechanism, processes and policies.

The limitations of the workman may, I believe, be summed up in the two characteristics: the narrowness of his individual attitude of mind, and the militancy of his organization attitude of mind.

An honest recognition of the facts makes it necessary to observe that, however noble and honorable of character, the great majority of working men have enjoyed neither the education nor the experience to render them broad and sympathetic in their views, informed concerning industrial facts, principles and tendencies, and possessed of trustworthy perspective and sense of values. The truth of this statement is possibly a damning indictment of society, and the fact that occasionally able men and even intellectual giants have risen from the ranks of working men, and that the prospects for all are improving, does not make it less so. The average working man has had to leave school at an early age, to begin the long struggle of support of self and family in a regime of the bartering of labor as a commodity, in which the advantages of bartering have been against him. He has had to rise at early hours and put in long days at the factory. He has returned at night weary, thinking principally of the sleep which will restore him for the morrow's work. So it has been, day in and day out. His work has been almost entirely repetitions of more or less automatic operations which have required neither wide contacts nor serious thinking. His function, howsoever socially important, has been a relatively simple one, and has not given him wide acquaintance with persons and things and ideas. His limited education has not given him the impetus, and the weariness of his evenings has not allowed him the inclination to seek contact with things and ideas in the written records of others. Is it surprising, then, that he is not appreciative of the complexity of the industrial mechanism and of the problems of management? Is it surprising that his judgment may not be reliable concerning the immediate and the ultimate consequences of some proposed new mechanism, process or policy? And is it surprising that in the experienced manager's mind the presumption should be against the helpfulness of the workman's judgment of things outside the narrow sphere of his hand or machine craft? Notwithstanding the immeasurable promises of better general and industrial education, the manager's prejudice is not unhuman.

I have suggested that, in the second place, the militancy of the workman's organization attitude of mind is also a limitation to the soundness of his judgment of industrial matters. One would, at first thought, believe that the judgment of the group could not rise higher than the average judgment of the individuals constituting the group. But that is not so, for the influence of the leadership of able minds enters into the calculation. In labor unions are very able individuals who become leaders, and succeed, under certain limitations, in impressing their views upon the group. The group mind should be, and unquestionably is, broader and more sympathetic of the complexity and sensitiveness of the industrial machine, and of the consequences of every proposed policy, than is the individual mind. But is it as much superior, in its actual expressions of itself, as the intellectual ability of group leaders gives us a right to expect and demand?

I believe not, for the reason that the group thinking and action is motived by a single purpose—a militant effort to achieve class solidarity and class prosperity in the midst of a regime of individual ownership of industrial equipment, managerial control, and bartering for a share of the surplus of productive operations. Other possible aims are neglected for, or subordinated to, or even misused for, this one dominating campaign. Truth in the statement of known facts, and in the search for attainable facts, is not sought for the sake of the truth, be its effect on men's minds what it may. Inaccurate statements are made, and false judgments uttered simply for strategic and tactical reasons. I am not affirming or denying the historical justice of this motive. I am simply stating what seems to be a fact, and suggesting that the fact is a limitation to the reliability of labor's judgment on new industrial mechanism, processes and policies.

Parenthetically it may not be out of place to observe that here are weighty reasons for management's hearty support of more thorough general and industrial education; and especially for a calm and dispassionate consideration of the possibilities in some other regime than absolute individual ownership, absolute managerial control, and purely individual bargaining.

If these serious limitations to the reliability of the workman's judgment be genuine, what then are the advantages in forming judgments on industrial matters which are possessed by the workman and which support my thesis that his judgment is a necessary complement to that of the manager?

The advantages, as I see them, may be summed up in the statement that workmen in the aggregate *are* industrial society for the benefit of which industrial operations are carried on; that as participants in industrial operations and beneficiaries of them, in the aggregate and in the long run they *sense* the ultimate influence of industrial undertakings. In discussing the advantages for forming judgments possessed by the manager, I described certain faculties for intuitive judgment developed in him by experience, which, because his experience is different from that of anyone else, make him able to perceive certain aspects of truth not visible to others. So it is with workmen in the mass. They also, because of their function in industrial operations, have experience which neither managers nor others have, and develop intuitive faculties which neither managers nor others have. They feel the direction of the current of industrial evolution, not because they are carried along in it, but because they are industrial society. Because of this, their intuitive faculties, specialized by their unique experience, sense the immediate and frequently the ultimate influence on the current of industrial progress of specific methods and policies. There may not be convincing reasoning behind their objection to a specific proposal, but there may be something more fundamental than reasoning which guides them.

I am not raising the question of the right of the workman to be called into consultation in determining the desirability of specific industrial methods and policies. I feel that what is right is probably what is, according to social experience, the ultimately socially expedient. If that be so, what we think and what we do will not deprive the workman of what is his right. I am arguing that from the point of view of industrial management in a regime of private ownership of the materials of production, of managerial control, of the motive of profits, it is expedient to match the workman's judgment against the manager's and the social scientist's, in order to obtain the benefit of the workman's unique advantages for judgment which in an increasing proportion outweigh his corresponding disadvantages.

THE SOCIAL SCIENTIST

I come now to the last of the trilogy of advisers which the programs of our meetings have called before us to assist in considering the problems raised by scientific management. The unpractical, book-reading, theoretical and dreamy social scientist! as some conceive him to be. What does he know about industry; he who does not do real work for a living? What does he know about management; he who is notorious for his inability to manage? I notice, however, that it is not asked what does he know about industrial evolution? Knowledge of that, so far as it can be known, is conceded to him. To know about the stream of industrial progress, of which manager and workman are atoms, is his specialized function. If that be so, may he not render judgment of some value concerning your practical industrial propositions, especially with regard to whether they are or are not adapted to survive the forces of industrial evolution?

I wish, before considering specifically the advantages and disadvantages of the social scientist for rendering judgments of value to us, to join issue with the implication in the antithesis between "practical" and "theoretical". In making such a contrast one is betrayed by a narrow point of view. The concrete proposition which you make to-day, which you call practicable, may prove to be unworkable next year. Was it really practicable? The theory Professor X proposed today you declare impracticable, but five years from now it may be working. Was it impracticable? The one was practicable for the moment, but it proved not to be for the long run. The other proved practicable in the long run but seemed not so at the moment proposed—possibly in many instances just because you thought it was not and did not support it. In fact, when you say a thing is impracticable, you mean it cannot at once be adopted, and you may be right. But when you say it is theoretical, you should mean that, while at the moment you believe it to be unworkable, it may in the long run be the fundamentally correct thing. Therein is the contrast you should have clearly in mind. The antithesis is not between "practical" and "theoretical", but between the immediately practicable and the ultimately practicable, between the superficially practicable and the fundamentally practicable, between current practice and principles of future practice.

If the mind of any class of investigators is concentrated on searching out the ultimately and fundamentally practicable, may not their judgments be of great value to the "practical" man who desires to work with the current of the stream which bears him along?

This brief consideration of the conventional error in the use of the words "practical" and "theoretical" suggests the advantages and disadvantages of the social scientist as a competent judge of industrial mechanism, processes and policies.

In the first place, he has not had industrial experience. He therefore lacks technical information concerning materials and men. He not only does not know how a given material will react to a proposed process, but he does not know how human nature will react at a particular time to a particular situation. He has not those intuitive faculties developed by manager and workman in the plane of industrial operations, of which I have emphasized the importance. He acknowledges, in fact formulated, the evolutionary principle that development to be substantial must come by small increments of change. But, because of lack of experience, he is not a judge whether a proposed measure is a small or too great an increment of change. Therefore we too frequently find him advocating measures which the manager's reason or intuitive faculties condemn as impracticable, i.e., too great an increment of change. We too frequently find the social scientist advocating measures which if put into operation, might "strip the gears" of the industrial machine.

In the second place, the social scientist too frequently adds to that disadvantage another: an unconscious assumption that some particular regime of industrial activity towards which he believes society is progressing is nearer than it really is, or is actually present. Possibly this disadvantage is but an intensified and specialized form of the first, but it exists and deserves special attention. It causes bias in the observation and in the interpretation of facts, for what a fact appears to be to an observer is determined in part by the environment in which he believes that fact to exist. For instance, I believe the fundamental error in the so-called Hoxie report on scientific management and labor is of this kind. There are, to one familiar with scientific management in operation, other conspicuous errors; but the great error is that the committee observed and interpreted facts with unconscious bias. Throughout the report scientific management is judged, not as a step in the evolution of industrial society, not as a reasonable and workable advance on current practice, not as a body of principles and mechanism which must fit into the existing industrial regime. Scientific management is not compared with other current management; it is compared with some form of management which belongs to a regime in which industrial democracy is more fully developed than at present. It is not therefore a reliable report on which to base current individual or state action. But just because it makes us consider scientific management in terms of a possible future industrial regime, it is a great report.

What is the relation of the social scientist to industry which enables him to see aspects of the truth which neither the workman nor the manager can see? It is that relation to industry in which he is not of industry, but is outside it. Both manager and workman are passing judgment with respect to something of which they are a part. The social scientist is passing judgment on something which he examines from without. That is a good principle of investigation and valuation, according to scientific management. The professional industrial engineer is impatient of that narrow-mindedness which prompts a board of directors to declare that no one outside their directorate can tell them about their business. It is just because the industrial engineer comes in from outside that he can see things in their business which they, who are of it, cannot see.

The social scientist, because he looks upon the facts of industry from outside and from a distance, gets the broader view and the larger relationships. The manager, intent on the problems of to-day, is like the person who would attempt to project a curve by two fixed points: the functionalized student of industrial development corresponds to him who establishes three or more fixed points before projecting the curve. Or, to draw another analogy: he is like the military scout on a mountain eminence who searches out the lay of the land to direct the army which is marching through the valleys below. The army below may be defiling eastward through a valley, and every private and company officer believes that to be the general direction of march; the scout and the higher officers who receive and value his advice know that the general direction of the march is intended to be westward. The scout has the advantage of the distant point of view. On the other hand, the officers and soldiers of the marching columns, with their more restricted outlook, are the only judges of where camp should be made tonight and again tomorrow night, for they are the only ones near enough to determine the most advantageous locations of fuel and water. Both the scout and the captain are practical men but they are practical on different planes.

It should be noted also that the social scientist, in his broad survey of industrial development, does not rely entirely upon what he sees for himself. He seeks both the manager's and the workman's observations and opinions, compares them with each other and with his own, and utilizes them in forming his own final judgments.

The social scientist's judgment of the social and industrial value of any industrial proposition is not less valuable than that of the manager and that of the workman. Each is enabled to observe phases of the truth which the other cannot see. An approach to the whole truth is secured by combining and harmonizing their judgments.

That is why a group of men standing for the Taylor philosophy of management should welcome—should insist upon—the widest possible discussion of all phases of scientific management. Especially should they contemplate thorough discussion from the three points of view to which I have given special emphasis. To the manager's point of view should be added those of the workman and of the student of social evolution. Each can contribute something derived from an experience which the others have not had. In this way only can the truth be approached, and the truth is not easy to approach; for scientific management which originated in Mr. Taylor's mind as a method for solving a particular problem of industrial productivity, and developed in his mind into a body of universal principles of management, has finally revealed itself as raising fundamental questions of industrial philosophy.

It is in accordance with these principles of inquiry that the programs of meetings of this Society have been constructed. I wish to give testimony that the membership has responded readily. Inquiry has grown in breadth and intensity, the membership has grown in enthusiastic co-operation, and the Society has grown in importance and influence. That has been due to the nature of the reaction to the plans of the Governing Board. If there is no abatement in the growth of the co-operation of its members, there is no limit which one may place to the ultimate influence of this Society. And one does not fear an abatement of enthusiastic co-operation.

SCIENTIFIC MANAGEMENT AND PROGRESS[1]

A Discussion of How Far Scientific Management is Coping with Present Day Industrial Problems, and What is the Outlook for the Future.

By Horace B. Drury[2]

[This paper was published in the Bulletin of the Taylor Society, Volume II, No. 4, and read by title at the annual meeting in New York City, December 9, 1916. The following is the discussion.—Ed.]

Lieut. Frederic G. Coburn:[3] The author apparently makes the point that time study and task study to a certain extent inhibit initiative on the part of the workman himself, and concerning that I want to make a specific comment to this effect. The ordinary workman learns his trade by accident; he chooses his trade and the workman from whom he learns it by accident.

Apprentice boys are not really taught trades; they "steal" them. It is a hit or miss matter. Now I am willing to admit that the time study problem is not susceptible of exact solution, but I claim that the result of time study is the evolution of a better way of doing the job.

There is no rule in any scientifically-managed plant that I know of, that says if a man discovers a better way than the prescribed way of doing a job it shall not be done that way. In my own experience I have been delighted indeed to find men who could show better ways, because there are always better jobs waiting for men like that. The difficulty is to find the man who has brains and initiative enough to think new ways of doing things. I am of the opinion that we spend too much time talking about time study and the troubles incident to making time studies and getting men to work under task-work with bonus. Times change.

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[1] An address given before the first Congress of Human Engineering, held under the auspices of the Ohio State University College of Engineering, October 6-8, 1916.

[2] Ohio State University, Columbus, Ohio.

[3] Harvard Graduate School of Business Administration, Cambridge, Mass., Naval Constructor, Charlestown Navy Yard.

They have changed greatly since Mr. Taylor started his classical work, and people have to change with these times.

Time study started the new movement. Time study in itself was an endeavor to get at the facts, and to get at the facts Mr. Taylor adopted the scientific method, of finding out the first thing, then knowing the first thing, stepping to the next thing and so forth. The time study and stop watch features have received all the attention.

But time study, important as it is, we know now is not of *primary* importance. I will illustrate that from my own experience. My connection is with the U. S. Navy Yards, and I am concerned principally with the repair and manufacture of ships, principally with the repairs. It is true that ship repairing, like ship building, consists largely in making holes and filling them up again. To that extent the work can be analyzed into a series of well-known and simple operations. Years ago at Mare Island we went into the planning of our work; the disintegration of the job; its routing; picking men and putting them on the job; we did a little time study and we settled the material question very well. But we were not getting the ships out on time.

The time element obtruded itself. The more I struggled with it the less I could see in the time study matter a solution for my problem. We gathered time study data; also a good deal of performance data, because our routing system had shown us how to accumulate data and put them where we could get them again and use them with intelligence.

We began to lay out the work with the heads of departments and head men and then we began to let this time feature show itself where we could do something with it. We have gone ahead and developed it to a point such that by the time I left the Philadelphia Navy Yard, four years later, we could do this sort of thing: one morning the Department called up the yard and wanted to know when a certain ship could be ready to sail. We were able to state in fifteen minutes, by consulting our schedules, the date on which we would finish her. There was a large amount of work to do on her, and much readjustment of other work. But we kept our promise.

The time element was there—we had some time study data to help us and enough other data, but it was not time study that saved the situation. We were not thinking about time study; we were thinking about the time of getting the job done. We have found out by carrying along the time idea that we can say, to the request for immediate completion of a job, "Very well, if you want that job done by Wednesday noon, here are some other jobs that must be deferred," naming the particular jobs, and how long they will be deferred. In the old days we were told to do the job, and were expected to get that job done and all the rest of the work too. In other words, the responsibility was passed to us. We now pass it back to where it belongs, to the management. We have shown up the inefficiency of our general management. Stonewall Jackson was a great general because he recognized the value of time. He copied from Napoleon. The Germans have copied from Napoleon. You notice that the Germans are always there a little ahead of the other fellow. Mr. Gantt told us, the other morning, of his way of putting back to the management a reflection of their own inattention as regards idle time. That is a development of scientific management which is simply this; that we are finding some facts and we are putting those facts into such shape that the financial man and even the director can understand them.

We have always been unable to make the financial man understand anything about time study. He has always had a readier ear for the working man having the iron heel of capital ground into his neck than he has had for the fellow running the shop. It was easier to say, "I hold the manager responsible for results." We are coming back to the management with our scientifically obtained and scientifically presented facts, and putting the onus right where it belongs.

We are doing that as regards the time of equipment, and we have for some time been doing it in regard to the time of doing jobs. If we are going to talk about scientific management and progress, let us talk about progress in scientific management. Let us say, yes, time study is with us, but we have learned a lot. Time study is now an incident.

It is part of the game. It helps us along. The great thing about scientific management to my mind is the idea that we are going to base our decision and action on the knowledge of fact. The author talks about democracy in industry.

There can be no democracy while there is distrust between the man who is working and the man who owns the money. When we can produce the facts and have a basis of facts upon which to talk we can eliminate distrust and have real democracy.

To sum up; to my mind the function of scientific management with regard to progress is found in the progress of scientific management. We are going to put the responsibility for industrial inefficiency, not with the workingman, where for so many years we thought that it belonged, but with the management, where we know very well now it does belong.

PROFESSOR JOSEPH H. WILLITS:[1] Mr. Chairman: I think I can say that I am in agreement with Dr. Drury's main thesis, namely, that if scientific management is to realize its greatest possibilities with regard to what it can contribute to progress, it must devote even more attention to the man in the plant. I believe that there is an added responsibility for scientific management to take such an attitude because of the fact that it is more intelligent and is therefore in advance of ordinary management with regard to its dealing with all of the factors under its control, I am in accord with Dr. Drury's main thesis on that particular point.

As a corollary to what Dr. Drury has said, however, I want to take the converse of his proposition and point out that not only must scientific management devote somewhat more attention to personal questions, but also that this science of personnel or science of human engineering, or whatever it may be called in different cases, can only persevere to the extent that it is linked up very closely with thoroughness and with the system of scientific management. While on the other hand you might have scientific management under certain leaders developing to a point, as Dr. Drury indicated, where it might not be democratic; nevertheless on the other hand, if your personal science or human engineering, or whatever it may be called, is divorced from the system and the thoroughness and science of scientific management, it is apt to be characterized by the attitude of "strong in the heart, but somewhat weak in the head"; it is apt to degenerate to the point where it may be welfare work that has no direct or even indirect relation with output.

Perhaps after Dr. Drury's statement with regard to some figures that Mr. Taylor used, it is not good form to point to the analogy between our treatment of domestic animals and our treatment of employes. Nevertheless, recognizing that no man's analogy ought to be pushed to its logical conclusion in every case, I am going to make my point a little clearer by referring to an analogy which has been made before. We have passed through or are passing through, as every one is more or less familiar with, three stages with regard to the treatment of domestic animals. In the first we had a period of disregard in which the treatment of domestic animals was entirely incidental and you had conditions which were cruel, to say the least. As the second stage in the treatment of domestic animals, we had the stage in which by coercive measures, certain humane-minded individuals endeavored to set up a minimum standard of conduct or a minimum standard of treatment of domestic animals below which nobody would be allowed to fall, and legislation was passed to enforce that standard of treatment. Our Societies for the Prevention of Cruelty to Animals were formed in this period. The third stage is marked by voluntary better treatment on the part of those who have domestic animals and is brought about by scientific study on the part of students of animal industry and of just what effect that poor treatment may have on production.

It seems to me that we, in our attitude toward the personal question in industry, are passing through essentially similar steps. We had as a first stage immediately after the Revolutionary War or industrial revolution, a condition of fourteen or sixteen-hour working days, in which almost no attention was given to the workmen's welfare or working conditions. As to the second stage, which we are largely in at the present time, we are endeavoring to control things by various legislative actions, various coercive actions which shall enforce a minimum standard of good treatment. That stage to some extent will be permanently necessary, but to a larger extent will pass over to what I think we might call the third stage, entirely analogous to the third stage in the treatment of domestic animals, in which we witnessed, as the result of scientific analysis, the effect of long hours on output, the effect of low wages and bad conditions on output. Here you find a voluntary attempt to bring about better conditions because it is in line with larger profits. With regard to this development of personnel science the service of scientific management is analogous to the service performed by students of animal industry. Scientific management reveals the facts which will point out the wisdom and methods of more thorough going personnel work. The two are interdependent, and your personal science cannot be developed in most cases to its best unless it is joined with the system and thoroughgoingness of scientific management. I can perhaps illustrate that somewhat specifically by referring to a case which came under my notice last Monday night. Mr. Feiss was addressing our executives or management organization in Philadelphia. He pointed out a fact which most of the people here are familiar with,—namely, his theory of the balance of personnel, the fact that, by the scientific methods which he has, he has worked out the number of employes that are required for different jobs in the plant to the point where on a particular morning he can say just how many men are necessary for each job. "This job needs two and seven-tenths employes, or one and three-tenths employes," or whatever it may be. He then routes employes from his reserve department in such a manner that each job has just enough and not too many employes. The amount of unemployment or time lost through waiting for work is practically eliminated.

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[1] Wharton School, University of Pennsylvania, Philadelphia, Pa.

As Mr. Feiss was making that point I was conscious of the fact that in the room in which he was there was present a number of representatives of one large concern not under scientific management, which did not even have a census of their employes in the central office. The significance of that is, in regard to the development of personnel work, that while we are all talking about lost time and unemployment and endeavoring to cure it by various forms of humanitarian legislation, scientific management has discovered that a large part of the lost time comes about through lost time within the plant, and is endeavoring to eradicate it. The particular plant that I refer to in Mr. Feiss' audience could not possibly hope, with its system, or lack of system, to eliminate much of lost time it had in the plant.

This is the corollary that I wished to mention with regard to Dr. Drury's paper. The two are interdependent: personal science or human engineering to an even greater degree than we have had it in the past is essential to the proper development of scientific management, and, conversely, scientific management is necessary to the development of the other.

Mr. Henry L. Gantt:[1] Gentlemen: I am sorry that I was asked to discuss this paper. I should much prefer to have been asked to talk on the subject without discussing a paper of this character. The only people who have any possible chance of being in the forefront of this movement are the people who are in the movement itself. It is not humanly possible for college professors to keep up with the movement; it is moving too fast. They are doing something else. If the man who is actually doing this thing from day to day does not know more about it than the man teaching mathematics and doing something else most of the time, he is unfit for the work. In other words, the men who are doing it must know more about it than those just hearing words about it. Therefore it seems to me that it is a great mistake for those people who are only hearing about it to write too much on the subject. They give a false impression to the community.

I am not condemning the professors. I only say it is impossible for a man who spends all of his time or most of his time teaching something else to keep up with a movement that is live and growing. The great thing about this is that Mr. Taylor put into it the germ which would grow. He did not give us a fixed or static thing that had no life in it. If he had, it would have been dead by this time. The world has changed in the last two years. If he had simply voiced a formula, something that was dead, something that did not mean anything except what it said on the surface, it would have been all gone, out of existence long ago. The whole world is being made over now. A lot of people do not know it yet, but they are going to learn it awfully quick. I don't know how long it is going to take, but two and a half years more of the great European War and we won't know where we are. I do not think many of us know now.

Dr. Drury's interesting paper on scientific management and progress indicates a great deal of labor on his part and much ingenuity, but it is highly academic, and I do not see that it throws much light on the future development of the art of management. He says that "system" does this and "scientific management" does that. His use of the terms "system" and "scientific management" seems to me to be strangely inconsistent. To my mind a system is a "mechanism" and scientific management a "method". Neither a mechanism nor a method can accomplish anything of itself, but only through the human intelligence and energy by which the mechanism or method is directed and applied. The same mechanism or method may be used for good or ill at the will of the directing force.

His discussion of Mr. Taylor's activities and ideals has to a large extent, been culled from the ideas of others, who were not very closely associated with Mr. Taylor in the early years, and is largely a series of opinions based upon other opinions. I became associated with Mr. Taylor in the year 1887 and found him a man of strong personality, dominated by a desire to use knowledge as the basis for all his actions. He was at that time chief engineer of the Midvale Steel Works, having risen to that position from being foreman and then superintendent of the machine shop. When he became superintendent of the machine shop some years previous he realized that the workmen were not doing as much work as it was possible for them to do. A short analysis of this situation convinced him that there were two causes contributing to this result. The first was the fact that employers in general paid to workmen only the minimum wage for which they could be hired and the workmen, naturally, performed the minimum amount of work which enabled them to hold their jobs. The second cause was a lack of knowledge on the part of both employer and employe as to the best methods of doing the work, and the amount that could be done. Up to that time practically all shop-methods were of an empirical or rule-of-thumb nature, which had been inherited from ancestors or borrowed fom contemporaries. He recognized at once the weakness of such a system and determined to apply the scientific method to the solution of the problems which he had to face. That is the analysis of how Mr. Taylor started.

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[1] Consulting Engineer, New York City.

There had already been established in the Midvale Steel Works a chemical laboratory with Russell W. Davenport as chief chemist, which was one of the first, if not the very first, of such laboratories established in this country. He was in a scientific atmosphere. There were people in high positions who recognized the value of science. I think that I am safe in saying that if there had not been such people at the head of the Midvale Steel Works, it would not have been possible to make any progress. The manager of the works at that time was Mr. Brindley, a graduate of Yale, who recognized the value of scientific knowledge. Mr. Taylor's first investigations into the cutting of metals and other problems soon satisfied him that if he could get work done in the manner indicated as best by these investigations, he could not only reduce the cost of doing the work, but pay greatly increased wages to the operators. Of course, when he began to pay increased wages to the operators, the same old conservative spirit, that you must not pay workmen more than so much, was thrown at him all the time, but he made considerable progress nevertheless.

When I entered his employ in 1887, this work had progressed to quite a considerable extent, although he did not have from his associates the sympathy and support that his results would seem to have justified. The name by which our office went was the "fish house." There were two of us there, one very tall man, and he was called the "big fish" and I was the "little fish." That is the amount of respect which was being shown these methods after seven years. You can imagine how many obstacles he had to overcome. He was, however, not to be discouraged by lack of co-operation, for he had become thoroughly convinced that industry in future must be based not on tradition nor opinion, but on facts, and that natural laws must take the place of the arbitrary laws, which had been deducted from opinions. As soon as he began to investigate anything he almost invariably found out that the usual view, concerning anything that had not been investigated was wrong, and that it had been somebody's guess. By getting the facts he immediately improved things to a degree almost inconceivable.

Inasmuch as the time element is one of the most important elements in all labor problems and the stopwatch is the means of measuring the time element, a great deal of emphasis has been laid upon its use—more emphasis indeed than there is any necessity for. The result of this has been that many young men equip themselves with stop-watches and set up as efficiency or scientific management engineers, greatly to the detriment of the cause.

On the whole, however, the determination of Mr. Taylor to base all of his actions on facts and to ignore opinions from whatever source, has spread quite extensively throughout the country and a great deal of industrial knowledge has been acquired. The acquisition of knowledge, however, is only part of the subject; the proper utilization of it is the other and in many respects, the more difficult half. As a matter of fact, the acquisition is considerably less than half. The problem of the future, therefore, is to devise methods of utilizing scientific knowledge of industrial processes in an efficient and economic manner. Mr. Taylor devised methods for doing this which are commonly known as the "Taylor System." It is likely that already other systems have been devised which accomplish the same in a more or less perfect manner, but they are all based on the fundamental principle which Mr. Taylor so strongly insisted upon, namely, that action should be based on knowledge and not on opinion.

It will seem to some of you who have been thinking about these things, as a very simple sort of an idea, that action should be based on knowledge and not on opinion; but I can tell you, those of you who have not not had very much experience, that three-fourths of our industrial processes today are based on opinion and not on knowledge. I went to a large concern a number of years ago, and we began talking about some of their processes. I suggested that a certain process might be worthy of investigation. "Oh, no," said they; "we have been doing it that way for fifty years, and it is all right." Any process which has ignored scientific knowledge for fifty years is apt to be a good long way from all right, and so we found it. We found it about as bad as it could be.

I want to say another thing. If Mr. Taylor had only devised a "system" it would only be a question of time in the evolution of things that that system would be gone. The system of one age is not adapted to the details of another age. Conditions change. The principle that he fought for was to base actions on facts and not on somebody's opinion. I am having opinions forced on me all the time. A very good fellow—he is dead now—employed in one of the works to which I once went had done a lot of work, he thought scientifically, and he wanted me to accept the results of his work. A very short investigation convinced me that he had not gotten the basic facts and that he had mixed up a certain amount of facts with a good deal of opinion, having taken for granted that certain things were true that they had been in the habit of regarding as true. He was very much worried when I would not do it, and began to make investigations. Very shortly we proved that a lot of things he considered as facts were absolutely wrong, with the result that the poor fellow had nervous prostration. He was terribly shocked. He found that he had been going on for years, as he thought, in the right line, but had not started at the bottom. He had taken for granted a lot of things that were soon proved to be inaccurate, to say the least. Many of them were absolutely incorrect.

The result of the policy of basing actions on fact only is most far-reaching, for, it substitutes natural law for arbitrary law, and gives us democracy in place of autocacy, for natural law is not any respecter of persons while arbitrary law is the conserver of privilege. If we base everything on facts, all are brought against the same standard. Privilege is one standard for one man and another standard for another. If we follow Taylor's injunction and base everything on fact, we are all judged by the same standard, and that is the basis of democracy.

It is doubtful if Mr. Taylor himself ever appreciated the revolution which his work was destined to accomplish, for there can be no more powerful instrument for the elimination of privilege in industry than the scientific solution of the problems involved. During the past two years the whole world has been undergoing a change. Things that we thought were all right a little over two years ago are proven to be worthless and dead wrong. Thinkers all over the world are seeing things in an entirely new light. Political economists and financiers all admit that they don't know where they are, that their theories that they have been teaching and preaching for years do not fit the present conditions, that everything seems to be going directly opposite from what they anticipated, and they have no conception where things will come out. If Mr. Taylor were alive today he would see these things more clearly than any of us. I think the world lost a great deal in the fact that he died just before these things were becoming clear, for they did not clear themselves up in the minds of many people until the war had been going on a year.

We do not realize that the conditions which brought the war in Europe to a head exist in this country. Possibly most of you will tell me that it is not so, that they do not exist. I tell you that they do. They exist here in perhaps a more dangerous form than they existed in Europe.

The most important contribution which Mr. Drury makes to the subject is when, after his discussion of Mr. Hoxie's report he says, "Yet underneath these surface arguments there exists a real clash involving fundamental principles. We are called to witness a struggle which it would be folly to try to evade, and which is bound to continue until both scientific management itself and the general character of our national life will have been profoundly affected."

A great many people sense the trouble. They know that something is wrong, but they cannot put their fingers on it.

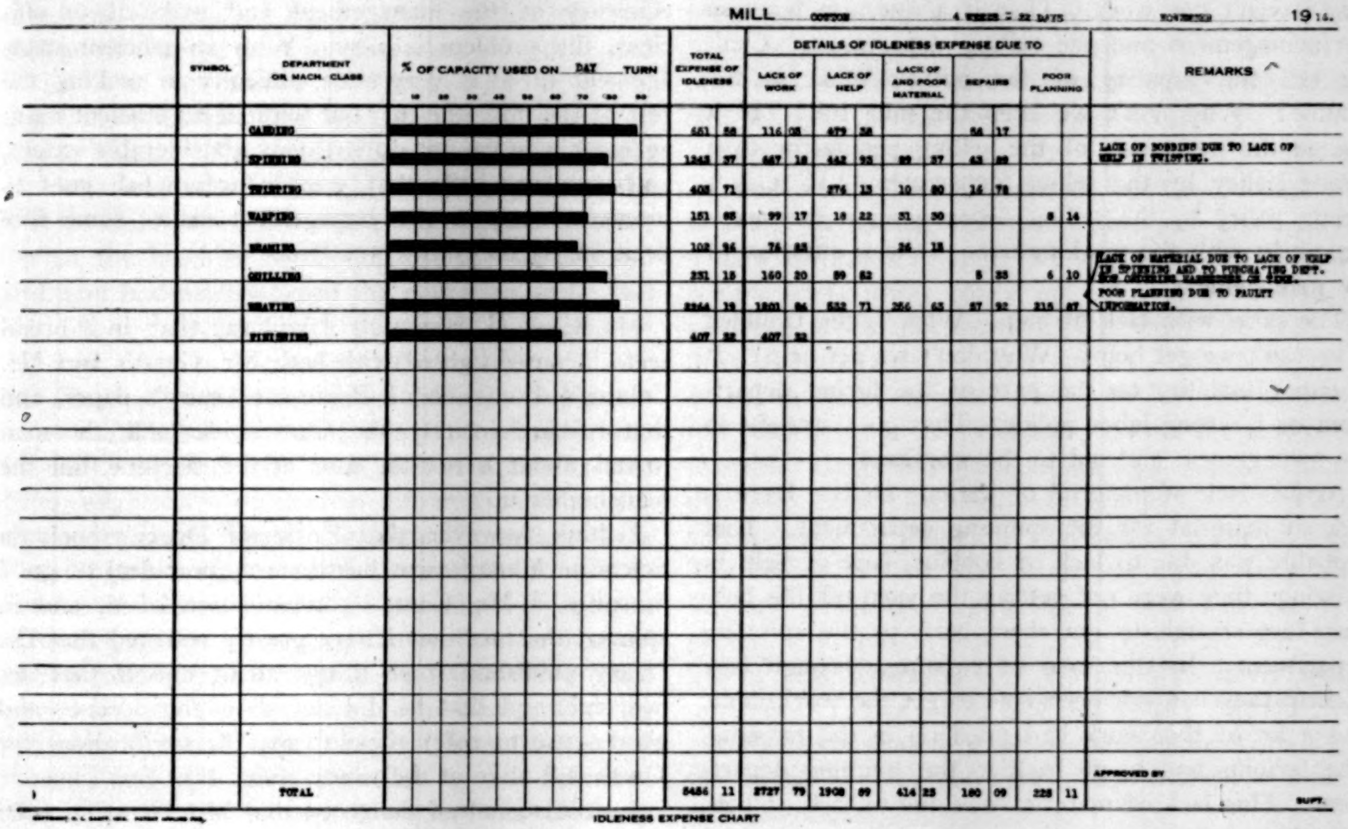
If scientific management in its best development were what he describes it to be, I should entirely agree with him. As it is I agree with him that we are to witness a struggle which will continue until the character of our national life has been profoundly affected. He does not indicate how it is to be affected, nor does he apparently sense the causes which are driving us toward this struggle which he so vaguely indicates. Further, he says that the "system" placed too much confidence in the unselfishness and public spiritedness of management. I think I can add that no successful system can be built upon unselfishness in a world where the dominating characteristic of mankind is selfishness. Self-preservation has been called the first law of nature and any scheme that does not take this into consideration must ultimately fall. The books on political economy have been telling us for a century that the interests of the employer and the interest of the employe are the same, but there is not, as yet, any working system that proves the truth of this on a large scale. Taylor was the first man in this country who even attempted to prove it.

The War now devastating Europe has done more to develop this idea into a working system than all of the books on political economy the world ever saw. But so far the lessons have been learned only in Europe. We still look at what is taking place there as if it were on another planet, something about which we had no concern. The warring nations in their extremity have learned that that which benefits one, benefits all, and that which works to the detriment of one works to the detriment of all.

We are today suffering acutely from the high cost of living and all realize that it is not due so much to the high cost of production as to the control of the markets by the distributors for their own benefit. This is one of the first things to which attention must be given, and indications are that it will have its full share of attention within the next year or two.

The warring nations have all decreed that all the forces in the community must work for the benefit of that community. In this country industry is still conducted solely for the benefit of investors, who cause the wheels to stop when their turning no longer benefits those investors, no matter how much their turning may be needed by the community. This is a condition which will not continue, simply because those to whom it works a detriment are rapidly coming to understand the situation and will not allow it to continue. If those who call themselves scientific managers are really worthy of the name, they will sense this situation before it becomes acute and do something to relieve it. The facts that point to this condition have been hidden in the past by accounting systems devised in the interests of investors. It is the function of those who are engaged in the application of science to industry to devise such a record keeping and accounting system as will make these facts plain to the man in the street. Up to now science has been applied to industry only so far as it affects the mechanical operations of the factories. The next step is to apply it to the managerial and business policies of the institutions. When this is done, the incompetent manager and incompetent financier, who have wrought so much havoc in the past will have to seek other occupations, just as the incompetent mechanic or engineer has often been obliged to seek a menial job.

I offer as my contribution to this work this chart, which I will ask to have put on the board. We all recognize that machinery that is not operating costs money. It costs money to own machinery. If you do not believe it, buy an automobile, and try to square up at the end of the year, or at the end of two years, you will then see how much you are out, even if you don't run it at all. That is a parallel of all kinds of machinery. It costs money to own it. We lose money on the thing we do not use during the time that we own it, and it depreciates, which causes additional loss. We have to rent space for it, which is an additional loss; we have to pay taxes on it, and insurance on it, so that all of these things together show us that our machine costs money, whether we run it or not.



MILL COTTON 4 WEEKS = 22 DAYS NOVEMBER 1916.

SYMBOL	DEPARTMENT OR MACH. CLASS	TOTAL EXPENSE OF IDLENESS		LACK OF WORK		LACK OF HELP		LACK OF AND POOR MATERIAL		REPAIRS		POOR PLANNING		REMARKS
	CARDING	651	58	116	05	479	36			56	17			
	SPINNING	1243	37	667	18	442	93	89	37	43	89			LACK OF BOBBINS DUE TO LACK OF HELP IN TWISTING.
	TWISTING	403	71			276	13	10	80	16	78			
	WARPING	151	68	99	17	18	22	31	30			8	14	
	BEAMING	102	96	76	83			26	13					
	QUILLING	251	18	160	20	89	62			5	33	6	10	LACK OF MATERIAL DUE TO LACK OF HELP IN SPINNING AND TO PURCHASING DEPT. NOT ORDERING HARNESSES ON TIME.
	WEAVING	2864	19	1801	86	552	71	256	63	57	92	215	67	POOR PLANNING DUE TO FAULTY INFORMATION.
	FINISHING	407	32	407	32									
	TOTAL	6456	11	2727	79	1908	89	414	23	180	09	228	11	APPROVED BY SUPT.

IDLENESS EXPENSE CHART

Let us rent a plant which has one hundred machines in it and pay one dollar a day rent for each machine. If we use only half of those machines we should find we used only half of our rent and there would be fifty dollars worth of rent that we did not use every day. I am not discussing whether we could have used it or not. I am only saying if we rented one hundred machines and used only fifty, we should lose half our rent. It is surely a good thing to know how much rent a plant is losing on their machines due to idleness. The figure on the slide represents the idle expense in a cotton mill. The cards were being run at eighty-eight per cent of their capacity, and the rent, taxes and insurance, depreciation of the cards which were not run, amounted to six hundred and fifty-one dollars in one month. One hundred and sixteen dollars of that was due to lack of work;

four hundred and seventy-nine dollars was due to lack of help; and fifty-six dollars due to repairs. When a carding machine is idle on account of repairs, its depreciation, the rent, the interest on the money we borrowed to buy it is going on all the same. Look at the record of spinning; run seventy-eight per cent of capacity; had twelve hundred dollars for idleness, due to lack of work, lack of help, lack of material and so forth. It is the same all the way down. Look at the weaving record; run eighty-three per cent of capacity, and had twenty-three hundred idleness, twelve hundred dollars due to lack of work, and so forth.

Let us see what this means: look at the column headed "lack of work,"—the machine is idle because they haven't got work. That is a question between the management and the selling department. Can't we sell the capacity of the mill? What is the trouble? Why don't we keep the mill full? Is it due to the incapacity of the selling people, or to a wrong policy by the selling department. If it is a wrong policy by the selling department, it has nothing to do with the workingman. It is a question of the management.

The same with lack of help. What is the trouble? Why can't we get help? Why don't we get help? It is either inability on the part of the hiring department or a wrong labor policy. That goes straight to the management and not to the workman.

Again: lack of material of various kinds. Here is lack of material for the spinning department. That probably was due to lack of bobbins, lack of help in twisting; they were not getting the yarn off the bobbins fast enough to get them back to the spinning department. In this case of twisting, through lack of help they had not been able to get the work done, and a lot of this work had piled up in the twisting. The bobbins had to go back to the spinning department. This lack of material was due to lack of bobbins there.

Refer now to weaving: lack of material due to lack of help in spinning, and of the purchasing department for not ordering harnesses on time. The harness is one of the tools used in a loom for moving threads up and down. They had work, but they did not get the harnesses to set up the loom to keep it running.

Repairs. These machines were shut down for repairs. In this case the repairing and maintenance department has two hundred and fifteen dollars worth of poor planning. They had the work, the materials and machines and everything, but did not arrange it right; did not get there on time; the orders were there; the materials were there but they did not operate the processes on time. All of these factors together are the fault of the management. That amounts to fifty-four hundred dollars; probably considerably more than the loss due to the inefficiency of the workmen that did the work.

In one case, when one of these charts was shown for the first time to some people who owned a mill—they were two brothers—one of them figured up and he said, "Bill, do you realize that we lost as much money last month due to our machinery being idle as we should have lost if we had had two hundred men standing idle in the plant a whole month?" We would raise a battle cry if we had two hundred men standing around idle, but nobody said a word about the machinery. It comes right straight back to the management. That is where to begin, to measure the efficiency of the management. If we can measure the efficiency of the management and make them efficient, the problem is easy. With an efficient management there is very little difficulty in making the rest of the mill efficient; but without an efficient management, you cannot do it to any considerable extent, and even the little that you do accomplish goes to pieces as soon as the management makes some fool decision, as they always will do.

Mr. Carl G. Barth:[1] I will say that, in a broad sense, I am delighted with both Mr. Gantt's and Mr. Coburn's discussion of Professor Drury's paper, and that I share entirely Mr. Gantt's idea that the man to talk about is not the man at the machine, but the man higher up.

I think, however, that Professor Drury's book on Scientific Management has done a great deal of good in spite of Mr. Gantt's condemnation of it, and in spite of the fact that I have greatly resented that Dr. Drury published some things about myself that are not true, and that he did not show the decency and good sense to refer them to me for verification, for I was still alive at the time.

I am also indeed delighted that Mr. Gantt so fully and beautifully cleared up the uncertainties about how Mr. Taylor first entered into this work, and the manner in which he briefly followed up the essential parts of it, up to the time when Mr. Gantt's intimate association with Mr. Taylor ceased.

While I wish to say something more, I am not going to try to philosophize about these matters, but will merely point out the mistake both Professor Drury and others make in principally judging scientific management by the work done by numerous mediocre or fake workers in the business, instead of by that of the real leaders, and the basing of so many of their arguments on the results of the work.

These mediocre and fake workers see but little in scientific management except time study and rate setting, and some of them from sheer ignorance, others because they have not the backbone to insist upon the right course being pursued by the management, often begin to practice their elements without any preparation in the way of repairs and standardization of machine tools and other equipment, or of standardization of methods. A couple of illustrations will serve to make my contention clear.

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[1] Consulting Engineer, Philadelphia, Pa.

Recently I got into a shop where some two to three years ago a bonus system had been installed as an incentive to the workers to increase the output of their machinery. One bonus job was thus the milling of the flukes in a small reamer of which an enormous quantity is consumed every year. At the time, the worker was making more money on this job than would ordinarily be paid for that class of work; and still, inside of two hours after I looked into it, it was being done with the feed of the machine increased eighteen times. The explanation is a very simple one. The man who had taken the time and set the bonus production, turned out to be utterly ignorant of what the machine could do, and the work could stand, and had merely timed the operation as he had found it; namely, run with the finest feed the machine had, whereas I found that the coarsest could be used. In this instance no serious difficulty had arisen but you will all realize that this kind of ignorance in a man entrusted with such serious duties as rate setting, might have resulted in different conditions.

Some years ago Mr. C. Bertrand Thompson made an investigation of numerous shops that had undertaken to install some kind of an efficiency system, and among many interesting things that he learned was the following: A shop in the Middle West had engaged one of the large and advertising efficiency companies to install a premium or bonus system of payment; and in a manner similar to that described above, one of the representatives of this efficiency company determined a bonus production as a punch press of some kind, without in any way improving the machine operation itself. After this was done, the operator, who happened to be a near relative of one of the higher officials of the company managed to have the speed of the press so increased that he without difficulty turned out twice the expected number of pieces per hour. Needless to say that the pretended efficiency man was dismissed at once.

To show you how seriously I look upon this matter of beginning to make time studies, and set rates by them too soon, I will mention that I still have two client companies that I took on in the early spring of 1913, and yet the time is only just approaching when time studies may be made in accordance with Dr. Taylor's principles, and then rates of one kind or another set by them.

It has taken all this time to bring the general management around and to get all the other preliminary work done in the shop, without which time-studies become worse than a farce. However, this preliminary work has of itself brought about such excellent results that everybody is satisfied, and that is why I am still with these companies.

Some of the results have been obtained by bringing to the attention of the management the utter folly of merely getting after the labor cost, while they remained unconcerned about valuable machinery standing idle for one poor reason after another. With the increased efficiency of the machinery we bring about, it is not always possible to procure work for it all. Thus nearly ten years ago I was able to report to the president of a certain company that after increasing the production of a certain department over fifty per cent., we were nevertheless utilizing only fifty-one per cent. of the average machine capacity.

Regarding the diagram Mr. Gantt has just shown us, and which he has devised for the purpose of showing the management the actual loss incurred in dollars and cents through idle machinery, I think the same is right nicely gotten up, but I fail to see in it anything essentially new or startling. In fact, it does to some extent annoy me, as it has been presented as something not covered by Mr. Taylor himself, which is not the case, and it is not the first time that Mr. Gantt has brought, as new matter, things that Mr. Taylor had fully covered in his production and cost system, though in a somewhat different way. The reason is that Mr. Gantt got away from Mr. Taylor's influence long before he had had the opportunity to learn even approximately all that Mr. Taylor had accomplished. He has thus never mastered Mr. Taylor's cost and accounting methods, as is fully demonstrated by his attitude towards certain of the problems that confront every factor-cost-finder and accountant.

By making these statements I do not mean to belittle what Mr. Gantt is doing, but I consider it both my duty and my pleasure to see to it that Mr. Taylor, as much as possible, gets credit for all he did; and more particularly so, as some day I may claim for myself and others the credit for some things that have erroneously been accorded to him.

I am a great admirer of the broad manner in which Mr. Gantt at times deals with his subjects, which it is beyond me to do, and I think it is about time that he became a member of our Society.

Mr. Walter N. Polakov:[1] I hope that I will not take any more than ten minutes to deliver my discussion on Mr. Drury's paper after hearing what Mr. Gantt said and several other speakers, the first speaker particularly. All I am going to say is practically a repetition of the same thing. If a thing is repeated, sometimes they don't want to throw the paper in the waste basket without reading it.

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[1] Consulting Engineer, New York City.

The reflections—using the word Professor Drury used—the reflections of the Professor about past, present and future of scientific management have brought him and the readers of his paper nowhere. The hearsay information that was the source of his lengthy narrative is not illuminated by a true understanding of causes and aims of this movement, and I am tempted to point out some of the errors into which he has fallen.

The historical perspective of the genesis of scientific management is artificially staged so as to make us believe that the gain of capital and number of workmen had something to do with the subject. Neither the Civil War nor any other historical event would have occurred had they not their economic reasons. Evolution in the economic relations in this country, as everywhere in the world, was the evolution of the mode of production. When feudal and individual production was replaced by capitalistic production, or, in other words, when the workman had lost the ownership of means of production his only means of existence was to sell his labor-power. The instruments of production were controlled by those who had the money to build them, and the workmen were hired at as low a wage as afforded them a means of existence. The value of their labor, added to the value of the raw materials, supplies, rent, wear and tear of machinery used, and so forth, made the value of the finished product higher than the cost of production. In the idealogy of the working class this surplus value and profit appears as unpaid labor, that is, the value added to the product by labor for which it did not receive in his opinion the full pay. This economic structure of our society thus finds its expression in the class struggle—the workmen desired to receive the full value of their labor; the capitalist just as anxious to retain as much profit as he could. Under such conditions, to speak about the possibility of establishing the harmony of the interest of employers and the employees is to reveal one's own ignorance as to the economic foundation of our social relations. This is the impression that we gathered from Mr. Drury's paper. Something like Mr. Gantt says, the system is established and should be based on egotism if it is to work at all; and this is what, in my opinion, Mr. Drury in his paper overlooked altogether.

Taking the wrong road, he naturally flounders helplessly through the mass of facts, the real significance of which was not explained to him by the books and the papers he read, until he is forced to leave this vicious circle and evasively admit that "underneath these surface arguments there exists a real clash involving fundamental principles." Yet he does not point out the fundamentals of the conflict, but hides behind the words pertaining to shortcomings of management, and talks further about "benevolent employer" and the like. The use of the stop-watch and other means adopted to substitute the knowledge of facts for old traditions and guessing had only one object in view: to increase the value of labor in larger proportions than the wages are increased by premiums. No learned treatise could hide this aim from the horse-sense of workmen, and the terms on which he consents to further increase the profits of his employer, is the improved working condition as far as hygiene, treatment, safety and so forth are concerned. The evolution within the scientific management movement itself was completely overlooked by Mr. Drury. The arsenal of facts both scientific and empirical upon which the training of workmen is to be made reached the proportion that the average management cannot handle, much in the same manner as the wild race for the improved equipment has reached the point when only part of it is utilized to advantage. Thus we do not need to be much worried that the timing of workmen met with opposition when a bigger problem looms so large: *how to increase the efficiency of the financier and the manager.* If the financial interests, controlling certain railroads, prefer to buy the power at nearly double the cost of their own production, leaving almost two-thirds of their equipment idle, the efficiency of firemen matters but little. As long as the factory owner ridicules the idea of reducing production cost, while he has still the opportunity of increasing the selling price, exact knowledge of facts pertaining to economic production is of no avail.

The democratization of industries as we see it, cannot be done through choirs or debating societies, but will be accomplished by the consistent admission of the principles that the industry shall benefit the whole country, not only the individuals controlling it. Then and only then the management aiming at making the commodities dear will collapse and the workmen getting the benefit of increased production will,

"Work for an age at a sitting
And never get tired at all."

MR. H. K. HATHAWAY:[1] I have only had an opportunity to glance over in a hasty way Mr. Drury's paper and consequently I hesitate to discuss it. Nevertheless there are two or three things that it might be well for me to get off my chest. I have for twelve years been directly engaged in the introduction of the Taylor system in various industries, and incidentally have been managing a manufacturing company under that system. I have thus had opportunity to see things from two angles: first, from the standpoint of the engineer making the installation; and second, from the standpoint of the man running a business under the system and dealing with men working under the system. I object very strongly to certain conclusions which Mr. Drury has expressed with respect to Mr. Taylor. I object to his statements as to the imperfect stage of development to which the system was brought under Mr. Taylor's own guidance. I am today applying in the plants of my various clients the system essentially as Mr. Taylor had it worked out before I came into the work twelve years ago. I do not find that it is at all imperfectly developed. I object to Mr. Drury's statement that Mr. Taylor himself was not much of a manager. Mr. Barth and I may have a difference of opinion on that, but I think it is a difference which could easily be reconciled. The fact that Mr. Taylor did not bend his course to the exigencies of the situation does not prove that he was not a good manager. It is to Mr. Taylor's unwavering steadfastness, his constant striving for an ideal, his unchangeable attitude that we owe the fact that we are meeting here to-day as the Taylor Society to discuss scientific management. Had Mr. Taylor yielded to the exigencies of the occasion, had he been willing to trim, he would have made his own lot much easier, but he did not do it. He stood fast for his principles. I think that is something we should be mighty thankful for, and for which future generations will be mighty thankful, rather than consider it something to be criticized.

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[1] Vice-President, Tabor Mfg. Co., Philadelphia, Pa.

As to Mr. Taylor's skill as a manager, I know in my own case, so far as managing me was concerned, it was quite satisfactory. I found early in my association with Mr. Taylor while I was working under Mr. Barth that when I did what Mr. Taylor told me to do, usually things came out about right. If I deviated from what he told me to do, they did not come out so well.

Mr. Drury's paper is, in a sense, a criticism of scientific management or the Taylor system as we today are endeavoring apply it. It may also be considered a criticism of a great deal that we would not be willing to accept or sanction as the Taylor system; but Mr. Drury's paper in common with the writings of certain other men who have not been in close daily contact with the running of a shop, the management of an industry, the handling of workmen—I have reference to Mr. Hoxie's book, and certain writings of our late friend, Mr. Valentine—it is a criticism of practice designed to meet existing conditions; conditions with which we have got to work, to meet the needs of men with whom we have to work; based upon a comparison with theoretical conditions which do not exist in fact. It is an error which any man who has not come through the mill will make. I am not saying this because I wish to criticize Professor Drury—I think he has done a fine piece of work here. The fact that several years ago, when he was quite a young man, he was able to make a study of scientific management, based upon his opportunity for investigating it, and write such a book as he wrote, I think speaks mighty well for Professor Drury. It is upon the efforts of men like him that we have got to fall back, after all, sooner or later, for aid in securing the coöperation which we want, the true coöperation with the workmen. We are getting it in the shops where we have scientific management in a small way; but we want it in a big way, in such a way that there will not be criticism which is unjust, nor opposition which is based upon misunderstandings and lack of knowledge as to the real interests of the worker such as was the case in the recent stop-watch legislation.

It might be assumed from reading Professor Drury's paper that the workman has not any part in the management of the shop; that you have the management on one side and the workmen on the other. Mr. Drury has not the proper conception of the spirit of scientific management or he would see that there does not exist between workmen and the management that sharp line of demarcation, that high stone wall which puts them in two different camps. In practice that is not the case. It is the case under the old type of management, but not under our type. As a matter of fact, the greater part of the management of a shop run under the Taylor system is in the hands of the workmen. Who are the men who run your planning department? Are they workmen or stockholders? Do the stockholders and directors come in and run your planning department? Not for one moment. Usually the principal men are those who have come from the shop, who have been promoted as opportunity presented and as they fitted themselves to take advantage of such opportunity.

In that way the workman has his say in the management. I do not run the Tabor Manufacturing Company, although I happen to be vice-president. Mr. Lewis, who is here this morning, the president of the company, does not run the Tabor Manufacturing Company.

There are fifteen or twenty men who do run that company. Every one of them has come from the ranks of the workmen. I see in this room to-day some of the men who came up through the ranks in the Tabor Manufacturing Company as workmen and to-day have advanced to such a point that the Tabor Manufacturing Company is too small for them.

They are now engaged in doing more important work for bigger companies. That does not look as if we stifled initiative in the workman. There are many academic arguments that might be advanced with respect to that question, as to the workman's part, the part that he should have and the part that he does have. As a matter of fact, in every shop run under the Taylor system the workman has his part in the management, and it is a very big one. Take the matter of making time-study for determining the best methods to be followed in any piece of work. It is not the time-study man alone that determines that method. The time-study man does a part, and his part is principally observation and suggestion; but it is the workman, working with him, who does as much to develop the best method as the time-study man, and in many cases a great deal more. This is real, effective coöperation.

Concerning the question of instruction and of the workman's initiative: Take a young man coming into the shop as a beginner. Suppose that Dr. Drury came to the Tabor Manufacturing Co., and wanted a job; that he had little or no previous experience in machine-shop work. Suppose they said to him, "All right; you go out in the shop and go to work." Suppose that little by little we filled our shop with men in that way, who came in and wanted a job and had no previous training; and just said, "Go out in the shop and go to work; use your own ingenuity as to how the work is to be done; exercise your initiative; develop yourself; do your own planning"—how far would we get? The whole social organization would break down under such a scheme. Mr. Drury, if he came to our shop and got a job, would be thankful for the instruction and help that he got from the functional foreman, if he needed the job or needed the money.

There is one more thing that is overlooked by our various critics, and that is the element of responsibility. The men who are to have the say in the management of a plant must assume a certain responsibility for results. I have not seen that sentiment put forth in any criticisms of this kind. I think the important thing for our critics to do is to get into the work, and work with it and criticize after they have worked with it.

PROFESSOR ROBERT M. HAIG:[1] Mr. Chairman, Members of the Taylor Society and Guests: I am not certain why I was invited to address you this afternoon, but I imagine it was because it was felt that it would be only humane to Professor Drury to have a fellow-economist present when his paper was to be discussed by a group of engineers! For affection toward professional economists is not one of the marked characteristics of the engineering profession. This is made very evident to any one who examines the literature of the field, and is even plainly shown by a number of the statements made in this afternoon's discussion. On the other hand, one does not have to search far to discover that the engineers do not meet with the entire approval of the economists, particularly when they attempt to deal with problems which are more or less economic in their nature. Consider, for example, that very irritating but essentially accurate portion of Professor Hoxie's recent book describing the manner in which the writers on scientific management have dealt with the labor problem—how they have put forward, with apparent confidence in their originality and essential soundness, "solutions" of the wage problem which have been abandoned by economists many decades ago. This situation is extremely unfortunate and some readjustment must be made if a proper rate of progress in the solution of the problems of industry is to be achieved.

The reasons for the lack of mutual appreciation and esteem are, in my opinion, not difficult to discover.—They consist almost entirely of misunderstandings due to ignorance on the part of each as to the value of what the other has to offer. The economists know little or nothing of engineering and they should know a good deal of engineering to deal intelligently with some of their problems. The engineers know little or nothing about economics and there are indications that they are beginning to realize that there are problems in the field of industrial management where a knowledge of economics would be useful.

The present situation indicates a fundamental lack in the system of training engineers, a lack for which the economists are in part responsible. Something should be done to impress students of engineering with the fact that a large part of their future success will depend upon the intelligence with which they meet the human problem involved. At present, the average student of engineering takes but a slight interest in his course in economics. He considers it something unessential and unimportant. Usually the time devoted to economics is much too short for a proper exposition of the subject and this is a factor weakening the interest. Doubtless much can be done by the economist to make his subject appeal more strongly to the engineering student, but after all, he labors at a disadvantage, for the training he offers can be realized upon only indirectly and at a more or less remote time in the future, while immediate recognition and advancement rest upon proficiency in technical and applied lines.

Even though it be granted that the economic training of engineering students should be strengthened, this will not entirely solve the problem. Much more could be accomplished if practicing engineers would inquire as to what the economists have to offer before laboriously rediscovering exploded "laws" and discarded solutions in their attempts to deal with the problems of management. Most of the criticism of Professor Drury's paper has been on the ground that he has not gained a full understanding of scientific management. Upon the justice of this type of criticism I am, of course, precluded from passing judgment, because I am not an engineer. I should like to make the point, however, that Professor Drury has at least made an earnest attempt to gain an understanding of your problem. It seems to me to be incumbent upon the engineers to make at least as earnest an attempt to understand what the economists have to offer. As evidence of the need of an acquaintance with economic theory, let me cite the fact that one of the leaders in scientific management recently devoted a substantial portion of a lecture before the graduating class of one of our engineering schools to an original version of the simple principle of elasticity of demand. To attempt to solve economic problems without utilizing the knowledge already made available by the economists is anything but scientific. It is criminally wasteful. The engineers should examine this field—should set a task for themselves, if you like, in the scientific literature of economics.

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[1] Columbia University School of Business, New York City.

I think that we would all agree that Professor Drury is accurate in his analysis when he states that the place where scientific management has been least successful has been in its attempt to gain the good will of the working class. Its aims and ideals have not been set forth in such a way as to make them attractive to the mass of the workers in this country. This is something that must be done if scientific management is to persist. It must be explained and adjusted to fit as a social institution. It is a human problem and we have the authority of Mr. Gantt for the statement that it is these human problems which are of greatest importance. My contribution to this discussion is designed merely to point out the desirability of coöperation with the economists in solving these human problems. Any functionalization which makes the engineer-manager not also an economist is ill-adapted to the situation with which we are face to face.

Mr. Robert B. Wolf:[1] The last speaker has made a plea that the engineer study political economy. I should like to suggest that the reverse process would also be helpful. The political economist should make his philosophy pragmatic by getting into closer contact with the every day problems which the engineer is trying to solve. I say this with all kindness and no thought of disrespect for the economist in rendering a real service. The present day political economy, however, does not adequately answer our needs for it is not sufficiently constructive. The abstract academic theories of the analyst will not lead us to a real basic conception of the reason for human activity so long as it is assumed that selfishness is the dominant emotion in the human heart instead of the desire to find self expression in creative work.

Mr. Sanford E. Thompson:[2] Many of the criticisms made by Professor Drury do apply to modern industrial methods as commonly practiced. However, it is just such dangers as he speaks of, just such faults of management, that scientific management is striving to overcome. Scientific management provides by its functional methods a distribution of managerial duties among a large group of men who supervise the various functions of planning, routing, inspection, training of the workers, and so on. This group of men is composed very largely of operatives who have shown themselves to be fitted for the various managing duties, many of whom without this opportunity would be confined perhaps for a life time to machine or hand labor. One of the chief aims of scientific management and one which affords the greatest benefits to the entire organization is the establishment of standards and the substitution of these standards for the haphazard and absolutely autocratic *opinions* by which the unscientifically managed shop is governed. These standards are not arbitrarily fixed but are the result of close scientific analysis conducted by an expert whose training and experience qualifies him for such work in exactly the same way as the training and experience of the expert diagnostician qualifies him for his. In both cases the expert is better able to tell what is the matter and how to correct it than the patient himself.

Such a set of standards once established are a guide to both manager and employee as to just what share of the work each is to do and how it is to be done. Neither is groping in the dark wondering whether what he is doing will merit praise or condemnation. If the standard is followed, each may be confident of the result.

Nor does scientific management shirk farther responsibility, once standards have been established. It patiently teaches the worker how the standards may be attained and maintained and thus trains and develops him into a more skilled and efficient worker. It insists that the conditions under which he works shall be safe and sanitary. It demands that his hours of labor and his manner of working shall conduce to his health and happiness. And it guarantees to him a large wage if he does his part in maintaining the standards. On the management it imposes duties and responsibilities unrecognized under the old type of management.

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[1] Manager of Manufacturing, Burgess Sulphite Fibre Co., Berlin, N. H.

[2] Consulting Engineer, Boston, Mass.

There comes to me a conversation that I had not long ago with a manufacturer who was installing scientific methods. We were sitting at a table in Young's Hotel, three of us, I think, and one of them looked up when there was a small break in the conversation and he said, "The girls up there would be surprised if they knew that we were having such a long conference to determine how they could earn more money."

In another part of his paper, Mr. Drury confuses, it seems to me, the industrial development that necessitates the substitution of machinery for hand labor, resulting in the minute division of labor, with the scientific method which is of an entirely different trend, the aid of which is to study conditions, to study the best way of doing a thing, to study the easiest way; to unite all of the forces into one symmetrical whole.

Does scientific management, as Mr. Drury implies, deprive men of the opportunity to create? Does any other form of management, on the other hand, give so great an opportunity to create?

Scientific management furnishes the worker with all of the accumulated knowledge that it has been possible to secure relating to his job. This is stated in simple terms in the form of an instruction for doing the work in the best possible way known to date. With this knowledge as a basis to work from he has every "opportunity to create" intelligently and every incentive to do so. Substantial rewards are always given for suggestions leading to an improvement in method. Under no other type of management are conditions so conducive to the profitable exercise of ingenuity and initiative. I want to say very emphatically that any management that is open to the criticism of depriving men of the opportunity to create and of not giving praise to the man who works, is not scientific and is not scientific because the very foundation of science and of scientific method must be to take, not superficial conditions into account, but all of the conditions, the human, the mechanical, and physical.

The opportunity to create is ever present. The greatest difficulty in industry is to find men who can or will create, who will take the initiative even in a small degree. But creation is not man's only pleasure. Do we not have pleasure in accomplishment, pleasure in doing a job well? Do we not have pleasure in getting a large pay-envelope and do not all of us here appreciate these things? Are these sordid aims? We appreciate any plan, any method, any development, by results. If scientific management does some of the things Professor Drury says it does, why is it that Mr. Feiss' shop has less turnover than other shops in the clothing trade? Why is it that the men and women there stick to their jobs and like it better than they do anywhere else? Why is it that the men of the Franklin Automobile Company were the only ones in the city of Syracuse that did not go out in the recent strike? Why is it you cannot get the men away from the Link-Belt Company? Why is it that the Eastern Manufacturing Company was practically forced to put in a system of scientific management in their pulp mill because in the adjacent paper mill they were getting results which the employees liked? Why is it that men write such letters as I have here, a letter from an employee of the Acme Wire Company? I will read a few sentences from the letter which illustrates the workmen's point of view of scientific management, especially as related to the bonus system:

> "After I am over my surprise that intelligent people in our days can try to stop a method that soon would show up as the only method under which the workingmen will work in the future, I shall gladly and frankly state my experience of working under a bonus system. I started to work for a concern which was putting in a bonus system (the Taylor system) in 1912. When I started to work the shop was still on day-work basis and all the jobs were day work. I was at that time earning eight dollars a week, but in a few weeks later I was transferred to some part of the shop where they all worked on piece work. After a little experience I could here earn from eleven to thirteen dollars, but when the whistle blew at night I would be all tired out because I started in full speed in the morning and kept it going as long as possible, but I would always be too tired to go anywhere at night. After a while the company was ready to put the whole factory on bonus basis, and I started to work after the new system, together with the whole room. At first we did not like it at all, but after a few days had passed we all found that we were not only making the same money and doing the same quantity of work, but never got tired out as we used to do, because there was a certain time set to do the operation in, which made us start in with speed which would enable us to finish the job in time, and by keeping it going with that speed all day, we would most of the time produce more than we did after the piece work system without being tired, and after the bonus system we could always be sure to get at least our day-rate pay . . . . The bonus system makes the workingman and his home happy, because he doesn't come home from work all tired out. He also gets fair wages and works under human conditions, with the same rights as the fellow workingman."

And from another employee of the Acme Company:

> "I find it (the bonus system) a great help to me, also to many others in this factory. It encourages us to put more interest in our work."

Mr. Drury: I should like first of all to thank the Taylor Society for the attention they have given to the subject of this paper. At the time the paper was written, there was no thought in the mind of the writer that any such special notice would be paid to it, particularly by persons so much better informed than the writer as to the matters which he discusses.

You will notice that more than half of the paper is an account of the origin and nature of scientific management, the enemies which have beset it, and the services which the movement has rendered. With regard to most of the points covered in this part, I take it that there is not much issue. It was written for the general public by a person not personally concerned one way or the other in the success of the movement, and—if I may say it—gave a great deal more credit to scientific management, to say the least, than the other address on the subject before the Congress of Human Engineering.

The only novel task which the paper undertakes is a consideration of the relationship between scientific management and the industrial background, during different periods. At the outset, I tried to explain how the need arose for such a movement, basing my conclusions upon an analysis of American conditions, as they affected the people of this country at about 1880. In the latter part of the paper, I ventured to raise the question as to how scientific management may be made not only to bring its present results, but also to fit in harmoniously with the new ideals which students of sociology, education, and government, and our people generally seem determined to introduce into our social life.

I am very sorry that so general an impression should prevail that the paper was written in what is called a critical spirit. It may have been written in too venturesome a spirit; it may be that such an essay has little chance of appearing worth while to men who are forging principles out of their own very concrete experiences. But at worst it is poor suggestion, or inappropriate suggestion, rather than adverse criticism.

The writer, to be sure, is not a disbeliever in adverse criticism; but if he were making it, it would not be of the sweeping character that many seem to consider this to have been, especially in the case of a movement such as scientific management. There has been criticism of that kind; but the author of this paper believes in the sort of criticism that tries to present in their true significance great ideas and great achievements. Merely to condemn without discrimination is to block progress, and create confusion and prejudice. Very few movements or individuals are so bad that they have no good points; and it may be doubted if even the best institution is wholly free from weaknesses. Criticism is valuable only in proportion as it discriminates.

I rather believe, though, that if all the statements made in the paper were carefully weighed, and all the qualifications that belong with them were taken into consideration, it would be found that there is, in fact, very little—possibly too little—adverse criticism. I have in mind several criticisms which I believe are valid and of some importance, and of which I have spoken personally with members of the Taylor Society. But, as it happened, I hardly touched upon them in this paper, and the little that I did say did not find an echo in the discussion.

What the speakers seem to have regarded as adverse criticism is the passage where I take up the question as to whether the present practice of scientific management will be adequate to cover future needs. I may be right or wrong on this question; but right or wrong, my answer to this query should hardly be construed as a criticism of existing scientific management.

One of the speakers has said that "any man who has not come through the mill" will make the error of criticizing "practice designed to meet existing conditions; conditions with which we have got to work, to meet the needs of men with whom we have to work; based upon a comparison with theoretical conditions which do not exist in fact." I would therefore call attention to a passage where, after discussing the divergence between the present practice of scientific management and the ideal, I explicitly state: "While we therefore believe that certain aspects of scientific management are not ideal, this is not to be regarded as an adverse criticism of Dr. Taylor, or his work. If only we recall the conditions under which scientific management was originated, we are compelled to forgive and *even praise* the course which Taylor followed." This is followed by a defense of almost every practice which I had before described as not ideal.

When it comes to the question as to whether scientific management as now practiced will be just the thing for the future, it must be admitted that all our opinions are more or less a matter of conjecture; but since I did hazard an opinion, I do not want it to be misunderstood. In spite of the feeling that my words seem to have left, I did not in the paper actually criticize time study either in the present or as an instrument for use in the future. Nor did I object to the practice of teaching standard methods to employees. On the contrary, in one place I called objections to the use of the stop watch "pitifully weak;" and again I said that there was nothing wrong in making the methods used by vast numbers of workmen "conform closely to one most efficient standard." And I will say now that I regard both of these practices as among the most important, if not the most important contributions which scientific management has made and will make to the world.